

Terrestrial Animal Health Standards  
Commission Report - March 2008

APPENDIX 3.4.1.

**HYGIENE AND BIOSECURITY PROCEDURES  
IN POULTRY PRODUCTION**

Article 3.4.1.1.

**Recommendations applicable to poultry, establishments (including hatcheries) and flocks**

This Appendix refers to poultry as defined in Chapter X.X.X.

1. Access to the *establishment* should be controlled to ensure only authorized persons and conveyances enter the site. This may require that the *establishment* be surrounded by a security fence. A suitably isolated geographical location is recommended, taking into account the direction of the prevailing winds and location of other poultry establishments. A sign indicating restricted entry should be posted at the entrance.
2. *Establishments*, or flocks, should be single purpose - single species enterprises, and ideally an all in all out single age group principle should be adopted whenever possible.
3. Where several flocks are maintained on one *establishment*, each flock should be managed as a separate epidemiological unit.
4. Poultry houses and buildings used to store feed or eggs should be constructed and maintained to prevent the entry of wild birds, rodents and insects.
5. Poultry houses should be designed and constructed so that cleaning and *disinfection* can be carried out adequately and preferably of smooth impervious materials.
6. *Establishments* should be free from unwanted vegetation and debris. The area immediately surrounding the poultry houses should ideally consist of concrete or other material to facilitate cleaning.
7. Animals, other than poultry of the resident species and age, should not be permitted access to poultry houses, and buildings used to store feed or eggs.
8. Clean outer garments (coveralls or overalls, hats and footwear) should be provided for all personnel and visitors before entering the poultry house. A physical hygiene facility and/or a disinfectant foot-bath should be provided, and the disinfectant solution should be changed regularly as recommended by the manufacturer. Personnel and visitors should wash their hands with soap and water or in a disinfectant solution before entering and after leaving the poultry house. Personnel and visitors should not recently have had contact with other poultry, raw poultry products, or poultry waste.
9. When a poultry house is depopulated, it is recommended that all faeces and litter be removed from the houses and disposed of in a manner approved by the *Veterinary Services*. After removal of faeces and litter cleaning and *disinfection* of the building and equipment should be applied in accordance with Appendix 3.6.1. If litter is not removed and replaced between flocks then the

litter should be treated in a manner to inactivate infectious agents, to prevent the spread from one flock to the next.

Microbiological monitoring of the efficacy of *disinfection* procedures is recommended when pathogenic agents have been detected in the previous flock.

Routine procedures for the prevention of entry of wild birds, and the control of rodents and insects should be carried out at this time.

10. Birds used to stock a poultry house should preferably be obtained from breeding flocks and hatcheries that are certified as free from vertically transmitted poultry pathogens.
11. The use of pelletised feeds or feeds subjected to other bactericidal treatment is recommended. Feed should be stored in clean closed containers to prevent access by wild birds and rodents. Spilled feed should be cleaned up immediately to remove attractants for wild birds, rodents and insects.
12. The water supply to poultry houses should be potable according to the World Health Organization or to the relevant national standard, and microbiological quality should be monitored if there is any reason to suspect contamination. The water delivery system should be disinfected between flocks when the poultry house is empty.
13. Sick and dead birds and dead in shell embryos should be removed from poultry houses and hatcheries as soon as possible or at least daily. These should be disposed of in a safe and effective manner (Appendix 3.6.6.).
14. Records of production/performance and flock history, including mortality, surveillance, treatment and vaccinations should be maintained on an individual flock basis within the *establishment*. Such records should be readily available for inspection.
15. There should be good communication and interaction between all involved in the food chain so that control can be maintained from breeding to production and consumption. Farmers should have access to basic training on hygiene and biosecurity measures relevant to poultry production and food safety. On-farm personnel should be trained to understand their responsibility in upholding the biosecurity guidelines in place on the premises.
16. For poultry flocks that are allowed to range outdoors, attractants to wild birds should be minimised (e.g. commercial feed and watering points should be kept inside the poultry house if possible). Poultry should not be allowed access to sources of contamination (e.g. household waste, other farm animals, surface water and manure storage areas). The nesting area should be inside the poultry house.
17. During the production cycle a veterinarian should be responsible for monitoring flock health on the farm.

#### Article 3.4.1.2.

#### **Recommendations applicable to hatching egg hygiene and transport**

1. The litter in the poultry house should be kept dry and in good condition. The nest box litter should be kept clean and an adequate quantity maintained. Cages should be maintained in good condition and kept clean.

2. Eggs or their conveyances should be marked to assist traceability and veterinary investigations.
3. Eggs should be collected at frequent intervals and placed in new or clean and disinfected packing materials.
4. Grossly dirty, broken, cracked, or leaking eggs should be collected separately and should not be used as hatching or table eggs. If eggs are cleaned on the farm, this should be done in accordance with the requirements of the *Veterinary Authority*.
5. Table eggs should be stored in a cool and dry room used only for this purpose. Storage conditions should minimise the potential for microbial contamination and growth. The room should be well ventilated, kept clean, and regularly disinfected. Cooling should be undertaken as soon as possible after collection. If available, refrigeration is recommended.
6. Refer to Article 3.4.1.7. regarding the specific requirements for the sanitization of hatching eggs and hatchery equipment.

#### Article 3.4.1.3

#### **Recommendations applicable to catching and transportation of poultry**

1. Personnel involved in the catching of the birds need to be adequately trained in bird handling and basic hygiene procedures.
2. Poultry should not be unduly stressed during the catching and transportation process. Reducing the light intensity or using blue light can help to calm the birds and reduce stress.
3. Poultry should be transported to the slaughter house or to markets in well ventilated *containers*, and not be over crowded.
4. *Containers* and vehicles need to be cleaned and sanitized between each use.
5. Poultry should not be exposed to extreme temperatures.

#### Article 3.4.1.4.

#### **Recommendations applicable to hatchery buildings**

- 1 The design of the hatchery should be based on suitable work flow and air circulation principles. It should be constructed so that there is a one way flow for the movement of eggs and chicks, and the air flow also follows this same one way direction.
- 2 The hatchery buildings should include physical separation of all work areas. If possible, separate ventilation should be provided for these work areas, namely, the rooms for:
  - a) egg receiving and egg storage;
  - b) egg traying;
  - c) fumigation;
  - d) setting or initial incubation;

- e) hatching;
  - f) sorting, sexing and placing chicks in boxes;
  - g) material storage, including egg and chick boxes, egg flats, box pads, chemicals and other items;
  - h) facilities for washing equipment and disposal of waste;
  - i) room for employees to have meals;
  - j) office.
3. The hatchery area should be maintained free from all hatchery waste, garbage of all kinds and discarded equipment.
  4. Approved disposal methods and adequate drainage must be available.
  5. All hatchery equipment, tables and horizontal surfaces in rooms must be promptly and thoroughly vacuumed, cleaned, washed, scrubbed, rinsed with clean water and finally disinfected with an approved disinfectant.

#### Article 3.4.1.5.

### **Hygiene measures during the handling of eggs and day-old chicks**

1. Egg handlers in the hatchery should wash their hands with soap and water and change into clean outer garments before handling *hatching eggs* received from the poultry farm.
2. Chick sexers and chick handlers should wash and disinfect their hands and change into clean outer garments before commencing work and between different batches of chicks.
3. Day-old chicks or other poultry should be delivered or distributed in new chick boxes; or in used boxes made of suitable material which have been thoroughly cleaned and disinfected or fumigated.
4. The chicks should be delivered directly from the hatchery by personnel wearing clean, disinfected outer garments, which should be changed or disinfected between each delivery.
5. The delivery truck must be cleaned, and disinfected before loading each consignment of chicks.

#### Article 3.4.1.6.

### **Sanitization of hatching eggs and hatchery equipment**

1. The clean eggs should be sanitized as soon as possible after collection. The methods of sanitization are described below.

2. The sanitized eggs should be stored in a clean, dust free room used exclusively for this purpose and kept at a temperature of 13-15°C (55°-60°F) and at a relative humidity of 70-80%.
3. The eggs should be transported to the hatchery in new or clean packing material which have been fumigated or sanitized with a liquid disinfectant (see Table I). The cleaning and *disinfection* of *vehicles* must be a regular part of the hatchery routine.
4. Sanitization means:
  - a) fumigation with formaldehyde, or
  - b) spraying with or immersion in an eggshell disinfectant in accordance with the manufacturers instructions, or
  - c) made hygienic by another method approved by the *Veterinary Authority*.

Formaldehyde gas has been used for many years for the *disinfection* of *hatching eggs* and hatchery equipment. As a fumigant, formaldehyde gas has proved to be a very effective means of destroying micro-organisms on eggs, egg packing material, chick boxes, hatching machines and other hatchery equipment, provided these items have been subjected to preliminary cleaning. When the correct mixture of formalin and potassium permanganate is used, a dry brown powder will remain after the reaction is completed.

At the present time, there is lack of uniform opinion on the optimum concentration of formaldehyde required for the sanitization of eggs and hatchery equipment. In general, three levels of concentration have been used. Also, two methods of use have been adopted.

#### Method 1

- a) Concentration A

53 ml formalin (37.5%) and 35 g potassium permanganate per m<sup>3</sup> of space.

This can be expressed as:

5.25 oz by volume (148.5 ml) formalin (37.5%) and 3.5 oz by weight (98 g) potassium permanganate per 100 ft<sup>3</sup> (2.8 m<sup>3</sup>) of space.

- b) Concentration B

43 ml formalin (37.5%) and 21 g potassium permanganate per m<sup>3</sup> of space.

This can be expressed as:

4 oz by volume (120 ml) formalin (37.5%) and 2 oz (60 g) potassium permanganate per 100 ft<sup>3</sup> (2.8 m<sup>3</sup>) of space.

- c) Concentration C

45 ml formalin (40%) and 30 g potassium permanganate per m<sup>3</sup> of space.

This can be expressed as:

4.5 oz by volume (135 ml) formalin and 3 oz (90 g) potassium permanganate per 100 ft<sup>3</sup> (2.8 m<sup>3</sup>) of space.

d) Procedure

Fumigation of *hatching eggs* and equipment should be carried out in a special chamber or in a room or building constructed of impermeable material which can be made as airtight as possible. A fan is necessary to circulate the gas during fumigation and to expel it after fumigation is completed.

The total volume of the room is determined accurately from the internal measurements. The space occupied by trays, or eggs, or articles to be fumigated, is to be disregarded. The quantities of materials required are based on the total volume.

Place in the centre of the floor, one or preferably several large metal basins, metal trays or containers of earthenware, enamelware, asbestos or other non-inflammable material.

Plastic or polyethylene containers are not to be used due to the heat generated by the chemical reaction. To avoid possible fire hazards, the containers should slope outwards. Also, the containers must be large enough so that the two chemicals occupy no more than one quarter of the volume of the container. Preferably, the container should have a capacity of at least 10 times the volume of the total ingredients.

The eggs should be placed on wire racks, in wire baskets or on cup-type egg flats stacked in a manner that will permit air circulation and exposure to the formaldehyde gas.

An electric or hot water heater should be available in the chamber to maintain the temperature at 75°-100°F (24°-38°C). Water pans or other equipment should be available to provide a relative humidity of 60-80%.

Place required amount of potassium permanganate into the containers before adding the formalin.

Pour the required amount of formalin onto the potassium permanganate in the containers.

Leave the chamber as quickly as possible and close the door. Some operators may wish to use a gas mask when pouring the formalin into the containers.

The door of the chamber should be securely closed and permanently labelled to prevent accidental opening.

The fans should be operated to circulate the formaldehyde and the fumigation time should be 20 minutes.

After 20 minutes, the gas should be expelled through a controlled vent leading to the outside of the building.

The door may be opened to facilitate expelling the formaldehyde to the outside.

## Method 2

An alternative method to the above is to use formaldehyde gas produced by the evaporation of paraformaldehyde. Proprietary preparations are available and the operation is carried out by placing the requisite amount of powder on a pre-heated hot plate.

In this method it is necessary to ensure that the relative humidity of the chamber is sufficiently high (60-80%).

10 g paraformaldehyde powder or pellet is used per m<sup>3</sup> of space.

## Warning

In carrying out fumigation, the following points should be borne in mind:

- a) Caution is necessary when formalin and potassium permanganate are mixed together in large amounts because of the risk of personal injury and fire through careless use. Formaldehyde gas causes irritation to the eyes and nose of the operator and the use of a gas mask is advised.
- b) Effective fumigation depends on optimum conditions of temperature and humidity. Formaldehyde gas rapidly loses its efficiency at low temperatures or in a very dry atmosphere.

## Article 3.4.1.7.

### **Fumigation procedures at the hatchery**

#### 1. Fumigation of eggs in setting machines

Eggs should be fumigated within 12 hours after setting and after the temperature and humidity has returned to normal operating levels. The temperature of the machines must remain at the operating level.

The setting machine doors and ventilators should be closed, but the circulation fan should be kept operating.

After fumigation for 20 minutes, the ventilators should be opened to the normal operating position in order to release the gas.

## Warning

Do not fumigate eggs that have been incubated for 24 to 96 hours, as this can result in embryo mortality.

#### 2. Fumigation of eggs in hatching machines

This is a common practice in certain areas and under certain conditions. The eggs should be fumigated after being transferred from the setting machine to the hatching machine and before 10% of the chicks have begun to break the shell. After transfer of the eggs, the hatching machines are permitted to return to normal operating temperatures and humidity. The ventilators are closed and fumigation is conducted with the fans running. In some countries, the standard amounts of formalin (53 ml) and potassium permanganate (35 g) per m<sup>3</sup> are used. Fumigation time is 20 minutes. In other countries, 0.8 cc formalin (37.5%) is added to 0.4 g

potassium permanganate for each ft<sup>3</sup> (0.02832 m<sup>3</sup>) of space; or 25 ml formalin to 12.5 g potassium permanganate per m<sup>3</sup>. Fumigation time is 20 minutes.

### 3. Fumigation of empty setting and hatching machines

Following removal of all the eggs or the chicks and the subsequent cleaning and *disinfection* of the empty machine, the disinfected egg trays are replaced and the machine prepared for the next batch of incubating eggs.

The doors and ventilators should be closed and the temperature and humidity returned to normal operating levels. Fumigation time should be at least 3 hours or preferably overnight, using the standard amounts of formalin and potassium permanganate (Concentration A).

The machines should be well ventilated before use to remove any residual fumigant.

#### Warning

The above fumigation procedure applies to a machine in which there are no *hatching eggs*. Eggs and chicks cannot be fumigated using the above fumigation time.

### 4. Neutralisation of formaldehyde gas

This can be achieved with a 25% solution of ammonium hydroxide using an amount not more than one half the volume of formalin used. The ammonia can be spread on the floor of the machine and the doors closed quickly.

*Table 1. Properties and uses of disinfectants*

Properties	Chlorine	Iodine	Phenol	Quats	Formaldehyde
Bactericidal	+	+	+	+	+
Bacteriostatic	-	-	+	+	+
Fungicidal	-	+	+	±	+
Virucidal	±	+	+	±	+
Toxicity	+	-	+	-	+
Activity with organic matter*	++++	++	+	+++	+
<b>Use area</b>					
Hatchery equipment	+	+	+	+	±
Water equipment	+	+	-	+	-
Personnel	+	+	-	+	-
Egg washing	+	-	-	+	+
Floor	-	-	+	+	+
Foot baths	-	-	+	+	-
Rooms	±	+	±	+	+

Quats = Quaternary ammonium compounds

\* = Number of + indicates degree of affinity for organic material and the corresponding loss of disinfecting action

+

= Positive property

-

= Negative property

±

= Limited activity for specific property



#### Article 3.4.1.8.

### General disease prevention and control measures

Recommendations in specific disease chapters should be followed as appropriate.

Disease prevention and control should be based on the adoption of Good Agricultural Practice and Hazard Analysis Critical Control Point (HACCP). No single measure used alone will achieve effective and efficient disease control. The biosecurity measures recommended in Article 3.4.1.1. should be applied.

1. The first week of life is important to develop immunocompetence in the birds and increase resistance to infections. It is important to have a good brooding system including appropriate temperature and humidity.
2. If the use of antimicrobials is indicated to control a poultry disease or infection, consideration should be given to the fact that it has the potential to produce residues in the eggs and meat, and may lead to the development of antimicrobial resistance. Antimicrobials should be used according to the instructions provided by the manufacturer and in accordance with Section 3.9. and the directions of the *Veterinary Services*.
3. Vaccination should be performed according to the instructions provided by the manufacturer and in accordance with the directions of the *Veterinary Services*. Recommendations in the *Terrestrial Manual* should be followed as appropriate.
4. Depending on the epidemiology of a disease, risk assessment, and public and animal health policies, culling is an option to manage infected flocks. Infected flocks should be destroyed or slaughtered and processed in a manner that minimises subsequent exposure to pathogens. Before restocking, the poultry house should be cleaned, disinfected and tested to verify that the cleaning has been effective. Special attention should be paid to feed equipment and water systems

#### Article 3.4.1.9.

### Prevention of further spread of poultry diseases

When a flock is found to be infected, in addition to the general control measures described previously, management procedures should be adjusted to effectively isolate the infected flock from other flocks on the establishment, adjacent establishments and from other establishments under common management. The following measures are recommended:

1. Farmers should be educated on how to handle infected flocks in order to prevent spread to adjacent establishments and/or human exposure. Personnel should observe standard disease control procedures (e.g. handle infected flock separately/last in sequence and use of dedicated personnel and clothing and, if possible equipment).
2. Control measures for wild birds, rodents and insects should be observed stringently.
3. Epidemiological investigations should be carried out to determine the origin of infections as appropriate to the epidemiological situation.

4. Movement of culled poultry should only be allowed for slaughter or destruction.
5. Poultry litter/faeces and other potentially contaminated farm waste should be disposed of in a safe manner to prevent the spread of infections.
6. After depopulation of an infected flock the poultry house should be thoroughly cleaned and disinfected, with special attention to feed equipment and water systems.
7. Before restocking microbiological examination should be carried out, as appropriate, to verify that the cleaning has been effective.